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EVALUATION OF A PORTABLE RUMBLE STRIP FOR SPEED REDUCTION IN CONSTRUCTION ZONES

INTRODUCTION:

Reference is made to Technical Memorandum No. 82-09, an interim report issued by Research and Development in November 1982 (see Appendix). This report will summarize the results of a second test of rope rumble strips in construction zones, which corroborate the initial results made in 1982.

This report will then conclude with a final list of recommendations regarding further use of rumble strips for construction zones.

FIELD TEST SITE:

On April 28, 1983 a second test of portable rumble strips was conducted on a bridge redecking project across Red Creek on Highway #4, 6 kilometres north of Coutts. The work required closing of a half of the roadway at a time, using one lane and shoulder to accommodate two-way traffic during construction. Note that the average annual daily traffic for this location is 1300 vehicles per day.

This highway is normally posted at 100km/h but during construction a 40km/h speed zone was enforced in the critical work area in conjunction with an 80km/h approach speed zone. (Refer to site plan.)

While rumble strips were placed at both sides of the construction zone, speed studies were conducted only along the south approach, i.e., for northbound traffic entering the zone. This approach was chosen because it was relatively flat and straight so that speed bias due to harsh alignment was not a factor.

As illustrated on the site plan, vehicular speeds were measured at two sites: 1) at the beginning of the 80km/h zone; and, 2) at the beginning of the 40km/h zone. The rumble strips were placed between these two signs, with the trailing strip at a distance of 150 metres ahead of the 40km/h sign. Strip spacing was at 50m as at the first test site.

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Initially speeds were recorded with no rumble strips in place to serve as a control group. Measurements were then taken with three, then four rumble strips in place.

The results of this study are summarized in Table I of the Appendix.

MODIFICATIONS TO ORIGINAL ROPE STRIPS:

The rumble strips used previously were constructed of one inch diameter nylon rope woven through 4x4 inch wooden posts. The later strips used polyproylene rather than nylon rope to reduce the cost of each strip. (See cost summary page 3, Appendix.) The wooden posts were replaced by aluminum channel. The decreased size of these end pieces made the rumble strips easier to handle and store.

FIELD TEST OBSERVATIONS:

The four sets of rumble strips were placed on the north end of the project by a four man crew in roughly twenty minutes. The four strips on the south end of the site were placed by a two man crew in roughly half an hour. A problem did occur with one rumble strip; as it was being unrolled several strands slipped over the ends of the aluminum channel causing them to get tangled. They were untangled with considerable difficulty. Some sort of guard should be affixed to the end pieces to ensure that the rope doesn't slip off in the future.

Once the strips were in place, it quickly became obvious from visual inspection alone that vehicles were definitely slowing down while crossing over the rumble strips. No vehicles showed any difficulty in manoevering as a result of the strips. Once over the strips, vehicles (particularly those who had slowed to well below the construction zone speed) began to pick up speed until they reached the critical area of construction. While the speed study results don't show this phenomenon, as no speeds were "officially" measured while vehicles were in the middle of the strips, visual observation and spot checks with the radar gun confirmed this. The speed study does show, as was the case in the previous test, that four strips induce greater speed reductions than three or two. (Note, no tests were conducted using five strips as it was felt that installation and removal would become more cumbersome, for diminishing gain.)

No testing could be accomplished at night or over a long duration period because the very first night, two of the eight strips were stolen and the following night an additional three were taken. Apparently the rope offers a big attraction to the general public. (In the interim report it was also noted that theft was a problem.)

Despite this set-back it was obvious that portable rumble strips did induce speed reductions by up to 40%. (Refer to speed study results, Table I, page 2, Appendix.)

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A final observation concerning the material used; it was noticed that the two strips which continued to be used for the duration of the project wore out after approximately two months. The nylon rope was still good after four months, though wear was beginning to show.

CONCLUSIONS:

1. Rope rumble strips provide an effective method of inducing vehicles to slow down.
2. The effect of the speed reduction is very localized, in the immediate area of the rumble strips only. This illustrates that these strips have a visual as well as aural effect on the driver.
3. Rope rumble strips are indeed portable and can be easily installed and removed by a two man crew.
4. The provision of a guard on the end posts would prevent tangling of the rope strands.
5. No way has been devised to anchor these strips in such a way as to make them theft proof yet still allow easy installation and removal by our own crews.

RECOMMENDATIONS:

1. Use portable rumble strips only when actual construction is ongoing. When work stops for the evening they should be removed to prevent theft.
2. Because of their localized effect in reducing speed, they should be used as close to the critical construction zone as possible, as a means of protecting on-site workers rather than as a speed reducing tool for the entire construction zone including approaches.
3. Either polypropylene rope or nylon rope is acceptable. While the nylon costs more it lasts longer so either can be chosen depending on availability.
4. Portable rumble strips would be well suited to construction projects where flag persons are being used to provide them with a little extra protection.
5. Because it takes a two man crew roughly thirty minutes to install four strips, their use on highly mobile projects such as chip sealing is not recommended.
6. A set of four strips on each approach to a construction zone is recommended for optimum effect.

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APPENDIX

TABLE I

SPEED STUDY RESULTS

Location: Highway #4, 6km north of Coutts

Date: April 28, 1983

Conditions: Daytime, sunny, dry road surface

Type of Construction: Bridge Redecking - lane closures

AADT: 1300 vehicles per day

Sample Size Range: 43-62 vph

# of Strips	# of Vehicles Surveyed	Percentile Speed	Vehicle Speeds (km/h) PT 'A' (at 80km/h sign)	PT 'B' (at 40km/h sign)
0	44	85	99.1	83.0
	43	50	86.5	65.2
3	50	85	91.9	70.0
	52	50	81.6	60.9
4	59	85	93.9	59.8
	62	50	77.2	49.1

PORTABLE RUMBLE STRIPS

COST SUMMARY

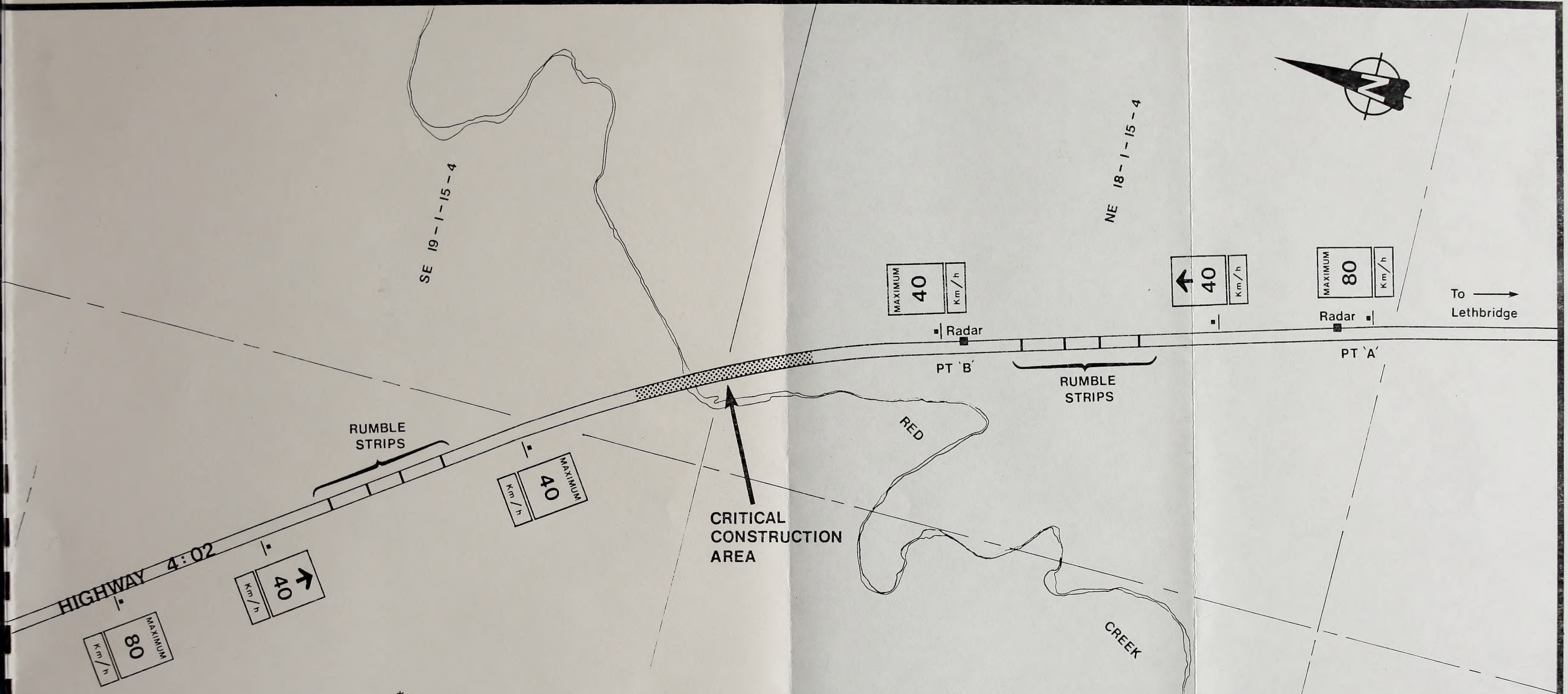
I Actual Cost of Materials for this Test: (8 sets of strips)

Materials:	
- Polyproylene Rope = 3600 feet x $0.48/ft.	= $1742.02
- Aluminum Channel	= 329.22
Fabrication Costs:	
- 52 hrs. @ $25.65/hr.	= 1333.80
TOTAL	= $3405.04

II Future Costs of Materials (1983/84):

Polyproylene Rope = $0.71/ft.

Nylon Rope = $1.43/ft.



DISTANCES:* "MAXIMUM 80 km/h" SIGN TO "40 km/h AHEAD" SIGN = 200 m
"40 km/h AHEAD" SIGN TO FIRST RUMBLE STRIP = 100 m
SPACING BETWEEN RUMBLE STRIPS = 50 m
LAST RUMBLE STRIP TO "MAXIMUM 40 km/h" SIGN = 100 m
"MAXIMUM 40 km/h" SIGN TO CONSTRUCTION AREA = 150 m

* ALL DISTANCES ARE APPROXIMATE.

Alberta TRANSPORTATION
RESEARCH AND DEVELOPMENT

HIGHWAY 4
RUMBLE STRIP
TEST SITE

APRIL 28, 1983

SEPTEMBER, 1983 | NOT TO SCALE | DIAGRAM ONE

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